

Mechanical Behavior of Refractory Metals Alloys

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Prepared for Presentation at the Advisory Group for Aerospace Research and
Development Meeting - June, 1996

Abstract

The refractory metals Molybdenum, Tungsten, Tantalum, and Niobium, find applications in very high temperature missile and space systems. These metals and their alloys have unique properties but also provide special challenges in processing. Refractory metal alloy development programs were heavily supported starting in the 1950s and several key alloys emerged over the next twenty years that remain in use to the present time such as TZM, unalloyed Mo, Mo-Re, Ta-W, and Nb-Hf. This presentation will emphasize metallurgical features, including texture development in BCC metals, associated with the processing and properties relevant to the refractory metals and their alloys. Included is the fact that in Molybdenum in recent years, an improved understanding of the role of oxygen and carbide distributions at grain boundaries has led to increased reliability and use of Mo in aerospace products. The presentation will also describe recent work on niobium alloys with an emphasis on the role of solute drag in controlling creep properties.

*This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.